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URSI

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NÉCROLOGIE

Prof. Krystyn Bochenek

Nous avons le profond regret d'annoncer le décès, survenu à Varsovie le 26 novembre 1966, du Professeur Dr Krystyn Bochenek, Secrétaire du Comité national polonais et Président de la Commission VI du Comité national polonais.

Nous présentons nos sentiments de profondes condoléances à nos collègues du Comité national polonais pour la perte qu'ils viennent de subir.

URSI NEWS

Edward Victor Appleton

Mr. J. A. Ratcliffe, Honorary President of URSI, has published in «Bibliographical Memoirs of Fellows of the Royal Society» Vol. 12, Nov. 1966 a complete biography of our late Honorary President, E. V. Appleton.

Mr. Ratcliffe has reviewed E. V. Appleton's activities starting from his early days, and going through his carreer as research worker and professor, government scientist, and Principal and Vice-Chancellor of the University of Edinburgh.

The 21 page booklet contains also some personal notes and reminiscences, a review of Appleton's work in early radio research, and in the research of the ionosphere.

The paper ends with the lists of Honours and Decorations awarded to Sir Edward Appleton in United Kingdom and in numerous foreign countries, and with a bibliography of the most important papers of E. V. Appleton.

On behalf of URSI, Mr. J. A. Ratcliffe should be congratulated and thanked for the homage rendered to one of the most eminent scientists in radio science and to one who has during many years worked to bring our Union to the place it has now in the scientific world.

XVe ASSEMBLÉE GÉNÉRALE

Compte Rendu

Le compte rendu de la Commission I — Mesures et Etalons radioélectriques, et celui de la Commission II — Radioélectricité et milieux non-ionisés (Compte Rendu des Assemblées Générales, vol. XIV-1 et vol. XIV-2) — sont sortis de presse et ont été distribués aux Comités Nationaux.

Des exemplaires supplémentaires peuvent être obtenus au Secrétariat général au prix unitaire de FB 50 (US $ 1, ou £ 0.7.6), frais d'expédition compris.

XVth GENERAL ASSEMBLY

Proceedings

The Proceedings of Commission I on Radio Standards and Measurements and of Commission II on Radio and Non-Ionized Media (Proceedings of General Assemblies, Vol. XIV-1 and Vol. XIV-2) have been issued and distributed to National Committees.

Supplementary copies are available at the General Secretariat at the price of BF 50 (US $, or £ 0.7.6), postage included.

Report

The December 1966 issue of the *Bulletin of the Royal Society* (Vol. 4, N° 4) contains a report on the XVth General Assembly of URSI summarizing the main decisions reached by the Executive Committee and the General Assembly.

NATIONAL COMMITTEES

Canada

OFFICIAL MEMBERS OF COMMISSIONS

Commission I : Mr. C. F. PATTENSON, National Research Council, Ottawa 2, Ontario.

Commission II : Dr. D. R. HAY, University of Western Ontario, London, Ontario.

Commission III : Dr. J. H. MEEK, Defence Research Board, Ottawa, Ontario.

Commission IV : Dr. F. J. F. OSBORNE, RCA Victor Research Laboratories, Montreal, Quebec.

Commission V : Dr. V. A. HUGHES, Queen's University, Kingston, Ontario.

Commission VI : Dr. M. P. BACHYNSKI, RCA Victor Research Laboratories, Montreal, Quebec.

Commission VII : Prof. R. E. BURGESS, University of British Columbia, Vancouver, British Columbia.

Commission VIII : Mr. E. A. WALKER, Defence Research Board, Ottawa, Ontario.

Israel

MEMBERSHIP

We inform our readers that the Israel Academy of Sciences and Humanities has appointed a National Committee to URSI.

The membership of the Committee is as follows :

Professor I. CEDERBAUM (*Chairman*), Dean, Faculty of Electrical Engineering, Technion, P. O. B. 4910, Haifa, Israel.

Professor M. ZAKAI.
Dr. J. MASS.
Dr. A. BRAUNSTEIN.
Eng. J. ZIEV.
Eng. J. SHAMIR.

United Kingdom

NEW PRESIDENT

The six-year term of office of Professor W. J. G. Beynon as President of the British National Committee has ended, and Professor H. E. M. Barlow has been elected new President of the Committee.

USA

RADIO SCIENCE

Studies of the atmosphere

Radio Science has published a special issue (Vol. I, N° 10, October 1966) on Radio Astronomical and Satellite Studies of the Atmosphere.

The papers published in this issue are :

I. — TOTAL ELECTRON CONTENT.

1. Some results of electron content measurements at Delhi from Faraday fading of S-66 transmissions. Tubi Ram TYAGI and Y. V. SOMAYAJULU.
2. Geographical distribution of total electron content dependence on geomagnetic activity. F. BERTIN, J. PAPET-LÉPINE and E. VASSY.
3. Latitudinal and diurnal variations of the ionospheric electron content near the auroral zone in winter. Ludwik LISZKA.
4. The Faraday fading rate for nearly transversal propagation. Jonathan MASS.
5. Measurement of the total electron content with the differential Faraday effect using the satellite Explorer 22. Christian MÜNTHER.
6. Variation in ionospheric electron content measured by radio waves from Syncom 3. Yoshiaki NAKATA.

7. Middle-latitude ionospheric total electron content : Summer 1965. J. A. KLOBUCHAR and H. E. WHITNEY.
8. Ionospheric measurements by means of the Early Bird geostationary satellite. P. F. CHECCACCI.
9. On the topside ionosphere over the American continents. K. L. CHAN.

II. — SCINTILLATION.

1. Brief review of scintillation studies. B. H. BRIGGS.
2. Influence of the terrestrial environment on the temporal and statistical characteristics of Jovian decametric radiation. Alex G. SMITH, W. F. BLOCK, W. A. MORTON, G. R. LEBO, T. D. CARR and C. N. OLSSON.
3. Parameters of a cloud-like distribution of electrons in the ionosphere. Leroy R. HUGHES.
4. High-latitude radio star scintillation measurements at 68 Mc/s made with a phase-sweep interferometer system. John M. LANSINGER.
5. Scintillation of a radio star at a subauroral latitude. Jules AARONS and Richard S. ALLEN.
6. Seasonal variations in occurrence of scintillation. George H. MUNRO.

III. — IONOSPHERIC ABSORPTION.

1. Multifrequency observations of sudden cosmic noise absorption and X-ray flares. A. P. MITRA, C. V. SUBRAHMANIYAM and V. C. JAIN.
2. Influence of solar protons on high-latitude ionospheric disturbance. Terence J. ELKINS.

IV. — TROPOSPHERIC ABSORPTION.

1. Tropospheric structure factors obtained from radio data. John B. SMYTH.
2. Seasonal atmospheric attenuation measurements at 3.27 cm wavelength. John P. CASTELLI.
3. Calculations of apparent sky temperature at millimeter wavelengths. Vincent J. FALCONE Jr.
4. Technique of observing the 5-mm self-emission from the oxygen of the earth's atmosphere to obtain a vertical sense. H. P. TAYLOR and J. A. CAMPBELL.

V. — HIGH-FREQUENCY PROPAGATION.

1. Ray-tracing study of HF ducting propagation with satellites. Ming S. WONG.
2. Satellite ORBIS experiment. S. BASU and S. SARKAR.
3. Synoptic data from the ORBIS experiment. J. P. MULLEN and R. S. ALLEN.
4. Design of a satellite-to-satellite communication experiment to explore HF/VHF guided propagation in the lower ionosphere. James I. BARKER and Mario D. GROSSI.

CONTENTS of *Radio Science*

Vol. I, N° 11, November 1966

— Rotating interferometer and its use in measuring the spread and coherence ratio of a scattered radio wave. H. A. WHALE and R. W. BANNISTER.

— Angle-of-arrival measurements performed over a 296-km troposcatter path. Richard N. KIEBURTZ and I. A. FANTERA.

— Microwave scattering from an underdense turbulent plasma. H. GUTHART, D. E. WEISSMAN and T. MORITA.

— Further experimental study of plasma sheath effects on antennas. John M. HAMM and George TYRAS.

— Observations on the propagation constant of the earth-ionosphere waveguide in the frequency band 8 c/s to 16 kc/s. F. W. CHAPMAN D. LLANWYN JONES, J. D. W. TODD and A. CHALLINOR.

— Gradient instabilities as possible causes of irregularities in the ionosphere. C. H. LIU and K. C. YEH.

— Kinetic theory and collisional detachment. Peter M. BANKS.

— Quasi-static theory of a cylindrical impedance probe for magnetoplasma. James R. WAIT.

— Call for Papers, Joint Conference on MF, LF and VLF Radio Propagation.

— Transmission loss for ionospheric propagation above the standard MUF. J. L. WHEELER.

— Current in a scattering antenna embedded in a dissipative halfspace. H. S. TUAN and Ronald W. P. KING.

— Quasi-static fields of dipole antennas at the earth's surface. Peter R. BANNISTER.

— USA National Committee Report, Fifteenth URSI General Assembly, Munich, Germany, September 1966 :

Commission 1. Radio measurement methods and standards.

Commission 2. Radio propagation in non ionized media.

Commission 3. Ionospheric radio.

Commission 4. Magnetospheric radio.

ELECTRONIC MEASUREMENTS AND STANDARDS

A two-week course in Electromagnetic Measurements and Standards will be offered August 7-18, 1967, by the Radio Standards Laboratory of the NBS Institute for Basic Standards in

association with the Bureau of Continuation Education of the University of Colorado.

This course in intended for professional staff members of industry, university, military and other government facilities whose responsibilities include precision measurements, standards, quality assurance and control, etc.

Topics will include : (1) a review of basic electromagnetic and circuit theory; and (2) the specification of fundamental electromagnetic standards, their operational realization, and their use. Emphasis will be placed on instruments and measurements used by leading standards laboratories to obtain the highest precision and accuracy. Sufficient theory of measurements and errors will be included so that the students may understand the concepts as applied in the course and may use these concepts to analyze other instruments and measurements.

Prerequisites :	Tuition :
Education equivalent to a B.S. degree in Electrical Engineering or Engineering Physics, and a year or more of actual working experience.	$ 200.00 Registration Deadline : July 15, 1967

Registration will be limited and early application should be made to ensure consideration. Registration will be closed July 15, 1967. Further details and registration forms will be available March 15, 1967 from : The Bureau of Continuation Education, Room 328, University Memorial Center, University of Colorado, Boulder, Colorado.

This course is offered by the Radio Standards Laboratory to disseminate information concerning electromagnetic standards and measurements to industrial, government and research laboratories.

US Department of Commerce
National Bureau of Standards
Boulder, Colorado.

COMMISSIONS ET COMITÉS

Commission I. — Mesures et Etalons Radioélectriques

NOTATIONS POUR LA MESURE DU TEMPS

Temps atomique

(Extrait du *Bulletin Horaire du Bureau International de l'Heure*, Série J, n° 13, janvier-février 1966)

NOTATIONS.

La différence entre deux échelles de temps T′ et T, à un instant donné, sera notée T′-T.

TUX abs *i* (X = 0,1 ou 2) est la valeur brute de TUX donnée par l'observation astronomique à l'observatoire *i*. Les corrections utilisées pour passer de TUO à TUI et TU2 sont supposées être celles du BIH.

TU1 *i* ou TU2 *i* est l'échelle de Temps Universel 1 ou 2 obtenue par lissage des observations astronomiques à l'Observatoire *i*.

(TU-Signal) reçu est la différence entre TU (ayant l'une des formes ci-dessus) de la réception d'un signal horaire à la station et l'heure nominale de ce signal.

(TU-Signal) émis = (TU-Signal) reçu-τ, τ étant le temps de propagation du signal.

TU1 déf ou TU2 déf désigne l'échelle de Temps Universel 1 ou 2, obtenue par synthèse de toutes les observations transmises au BIH. C'est l'heure définitive.

TEMPS ATOMIQUE.

Les fréquences des étalons atomiques sont définies dans un système où la fréquence correspondant à une transition d'énergie hyperfine de l'atome de Césium est conventionnellement :

$$f(\mathrm{Cs}) = 9\,192\,631\,770 \text{ Hz}.$$

Les fréquences des divers étalons atomiques peuvent être comparées entre elles par l'intermédiaire des fréquences étalon diffusées par certains émetteurs radioélectriques. Il est donc possible de construire, à partir d'une origine arbitraire commune, les échelles de Temps Atomique, dénotées TA*i*, associées aux divers étalons *i* et de les comparer entre elles. Ces échelles ne sont pas confondues par suite des erreurs accidentelles et systématiques des fréquences. On peut former des échelles moyennes. Le BIH utilise l'échelle moyenne A3.

Echelle A3.

De janvier 1958 à décembre 1965, A3 a été l'échelle de TA déduite sans pondération des étalons de fréquences des laboratoires suivants :

National Physical Laboratory, Teddington, Grande-Bretagne;

Laboratoire Suisse de Recherches Horlogères, Neuchâtel, Suisse;

National Bureau of Standards, Boulder, USA.

Les valeurs de 5 jours en 5 jours de TU2 déf-A3 à 0 h TU ont été publiées :

— de 1958 à 1964 inclus : dans le Bulletin horaire J7;

— pour 1965 : dans les Bulletins horaires J7 à J12.

L'origine de A3 est telle que :

TU2 déf-A3 = + 0,^{s}0039, le 1er janvier 1958 à 0 h TU.

Il subsiste, dans les valeurs tabulées un saut de 0,^{s}0016 le 1er janvier 1962, dû au changement des longitudes conventionnelles et au changement du catalogue d'étoiles de référence (passage du FK3 au FK4). Ce saut affecte TU2 déf. Il faut ajouter —0,^{s}0016 aux valeurs antérieures au 1er janvier 1962 pour exprimer tout un système complètement homogène.

En 1966, A3 a été définie comme l'échelle moyenne pondérée des échelles de temps atomique provenant d'étalons absolus indépendants.

Pour calculer les différences de fréquence de A3 relatives aux divers étalons Ei : (freq. A3)-(freq. Ei), on a résolu le système d'équations surabondantes fourni par toutes les comparaisons de fréquences-étalon et de fréquences de Ei qui ont été communiquées au BIH. Cette nouvelle méthode et la nouvelle définition de A3 ont été appliquées à partir de l'heure demi-définitive de mai 1966 et de l'heure définitive de janvier 1966.

UNITES ET SYMBOLES

(See English text on p. 16)

L'URSI, sur proposition de la Commission I, a recommandé (Recommandation I.1) l'emploi pour la mesure des grandeurs électriques et radioélectriques du Système International (SI) adopté par la Conférence des Poids et Mesures en 1961.

Nous publions ci-après la Résolution 12 de cette Conférence.

Système International d'Unités

La Onzième Conférence Générale des Poids et Mesures,

considérant

la résolution 6 de la Dixième Conférence Générale des Poids et Mesures par laquelle elle a adopté les six unités devant servir de base à l'établissement d'un système pratique de mesure pour les relations internationales :

Longueur	mètre	m
Masse	kilogramme	kg
Temps	seconde	s
Intensité de courant électrique	ampère	A
Température thermodynamique	degré Kelvin	°K
Intensité lumineuse	candela	cd

la résolution 3 adoptée par le Comité International des Poids et Mesures en 1956,

les recommandations adoptées par le Comité International des Poids et Mesures en 1958 concernant l'abréviation du nom de ce système et les préfixes pour la formation des multiples et sous-multiples des unités,

décide

1° le système fondé sur les six unités de base ci-dessus est désigné sous le nom de Système International d'Unités;

2° l'abréviation internationale du nom de ce Système est : SI;

3° les noms des multiples et sous-multiples des unités sont formés au moyen des préfixes suivants :

Facteur par lequel l'unité est multipliée		*Préfixe*	*Symbole*
1 000 000 000 000	$= 10^{12}$	téra	T
1 000 000 000	$= 10^{9}$	giga	G
1 000 000	$= 10^{6}$	méga	M
1 000	$= 10^{3}$	kilo	k
100	$= 10^{2}$	hecto	h
10	$= 10^{1}$	déca	da
0,1	$= 10^{-1}$	déci	d
0,01	$= 10^{-2}$	centi	c
0,001	$= 10^{-3}$	milli	m
0,000 001	$= 10^{-6}$	micro	μ
0,000 000 001	$= 10^{-9}$	nano	n
0,000 000 000 001	$= 10^{-12}$	pico	p

4° sont employées dans ce système les unités ci-dessous, sans préjudice d'autres unités qu'on pourrait ajouter à l'avenir :

Unités supplémentaires

Angle plan	radian	rad
Angle solide	stéradian	sr

Unités dérivées

Superficie	mètre carré	m^2	
Volume	mètre cube	m^3	
Fréquence	hertz	Hz	I/S
Masse volumique (densité)	kilogramme par mètre cube	kg/m^3	
Vitesse	mètre par seconde	m/s	
Vitesse angulaire	radian par seconde	rad/s	
Accélération	mètre par seconde carrée	m/s^2	
Accélération angulaire	radian par seconde carrée	rad/s^2	
Force	newton	N	$kg.m/s^2$
Pression (tension mécanique)	newton par mètre carré	N/m^2	

Viscosité cinématique	mètre carré par seconde	m^2/s	
Viscosité dynamique	newton-seconde par mètre carré	$N.s/m^2$	
Travail, énergie, quantité de chaleur	joule	J	N.m
Puissance	watt	W	J/s
Quantité d'électricité	coulomb	C	A.s
Tension électrique, différence de potentiel, force électromotrice	volt	V	W/A
Intensité de champ électrique	volt par mètre	V/m	
Résistance électrique	ohm	Ω	V/A
Capacité électrique	farad	F	A.s/V
Flux d'induction magnétique	weber	Wb	V.s
Inductance	henry	H	V.s/A
Induction magnétique	tesla	T	Wb/m^2
Intensité de champ magnétique	ampère par mètre	A/m	
Force magnétomotrice	ampère	A	
Flux lumineux	lumen	Im	cd.sr
Luminance	candela par mètre carré	cd/m^2	
Eclairement	lux	lx	lm/m^2

Nous signalons également une brochure publiée en décembre 1965 par la «British Standards Institution (BSI)» et intitulée «The Metric System in the United Kingdom — The Use of SI Units».

UNITS AND SYMBOLS

(voir texte français p. 14)

URSI on the proposal of Commission I recommended (Recommendation I. 1) that for the measurement of electrical, electronic and radio quantities, the International System (SI) adopted by the General Conference of Weights and Measures in 1961, be used.

The original Resolution 12 of the Conference is published in French language p. 14.

It should be mentioned that the «British Standards Institution (BSI)» has published in December 1965 a booklet entitled «The Metric System in the United Kingdom — The Use of SI Units».

We are publishing hereunder some parts of that booklet.

SI units

1. — Basic SI Units

Quantity	*Name of unit*	*Unit symbol*
length	metre	m
mass	kilogramme	kg
time	second	s
electric current	ampere	A
thermodynamic temperature	degree Kelvin	°K
luminous intensity	candela	cd

2. — Some derived SI units having special names

Physical quantity	*SI unit*	*Unit symbol*	
force	newton	N	= kg m/s^2
work, energy, quantity of heat	joule	J	= N m
power	watt	W	= J/s
electric charge	coulomb	C	= A s
electrical potential	volt	V	= W/A
electric capacitance	farad	F	= A s/V
electric resistance	ohm	Ω	= V/A
frequency	hertz*	Hz	= s^{-1}
magnetic flux	weber	Wb	= Vs
magnetic flux density	tesla	T	= Wb/m^2
inductance	henry	H	= V s/A
luminous flux	lumen	lm	= cd sr
illumination	lux	lx	= lm/m^2

Note : Temperature difference is commonly expressed in degrees Celsius instead of degrees Kelvin. But the unit for Celsius and Kelvin scales is the same : 1 degree C = 1 degree K (see Appendix B).

(*) The term «cycle per second» (c/s) has been used in the U. K.

3. — Some derived SI units with complex names

Physical quantity	*SI unit*	*Unit symbol*
area	square metre	m^2
volume	cubic metre	m^3
density (mass density)	kilogramme per cubic metre	kg/m^3
velocity	metre per second	m/s
angular velocity	radian per second	rad/s
acceleration	metre per second squared	m/s^2
angular acceleration	radian per second squared	rad/s^2
pressure	newton per square metre	N/m^2
surface tension	newton per metre	N/m
dynamic viscosity	newton second per metre squared	Ns/m^2
kinematic viscosity / diffusion coeficient	metre squared per second	m^2/s
thermal conductivity	watt per metre degree Kelvin	W/(m °K)
electric field strength	volt per metre	V/m
magnetic field strength	ampere per metre	A/m
luminance	candela per square metre	cd/m^2

Definitions of derived units

force	The unit of force called the newton is that force which, when applied to a body having a mass of one kilogramme, gives it an acceleration of one metre per second squared.
energy	The unit of energy called the joule is the work done when the point of application of a force of one newton is displaced through a distance of one metre in the direction of the force.
power	The unit of power called the watt is equal to one joule per second.
electric charge	The unit of electric charge called the coulomb is the quantity of electricity transported in one second by a current of one ampere.

electric potential	The unit of electric potential called the volt is the difference of potential between two points of a conducting wire carrying a constant current of one ampere, when the power dissipated between these points is equal to one watt.
electric capacitance	The unit of electric capacitance called the farad is the capacitance of a capacitor between the plates of which there appears a difference of potential of one volt when it is charged by a quantity of electricity equal to one coulomb.
electric resistance	The unit of electric resistance called the ohm is the resistance between two points of a conductor when a constant difference of potential of one volt, applied between these two points, produces in this conductor a current of one ampere, this conductor not being the source of any electromotive force.
frequency	The unit of frequency called the hertz is the frequency of a periodic phenomenon of which the periodic time is one second.
magnetic flux	The unit of magnetic flux called the weber is the flux which, linking a circuit of one turn produces in it an electromotive force of one volt as it is reduced to zero at a uniform rate in one second.
magnetic flux density	The unit of magnetic flux density called the tesla is the density of one weber of magnetic flux per square metre.
electric inductance	The unit of electric inductance called the henry is the inductance of a closed circuit in which an electromotive force of one volt is produced when the electric current in the circuit varies uniformly at the rate of one ampere per second.
temperature	The units of Kelvin and Celsius temperature interval are identical. A temperature

	expressed in degrees Celsius is equal to the temperature expressed in degrees Kelvin less 273.15 (*).
luminous flux	The unit of luminous flux called the lumen is the flux emitted within unit solid angle of one steradian (**) by a point source having a uniform intensity of one candela.
illumination	The unit of illumination called the lux is an illumination of one lumen per square metre.

(*) This is true for the thermodynamic scale and for the international practical scale of 1948. There are, however, slight differences between thermodynamic scales and practical scales.

(**) One steradian is the solid angle which, having its vertex at the centre of a sphere, cuts off an area of the surface of the sphere equal to that of a square with sides of length equal to the radius of the sphere.

Commission III on the Ionosphere

CHANGE OF ADDRESS

As of 1 July 1967, the permanent business address of Prof. C. O. Hines, Chairman of Commission III will be as follows : Professor C. O. HINES, Department of Physics, University of Toronto, Toronto 5, Canada.

INDICES D'ACTIVITE SOLAIRE POUR LA PROPAGATION IONOSPHERIQUE

(Extrait du *Journal des Télécommunications*, Vol. 34, nº 1, janvier 1967)

Les tableaux ci-après, contenant les valeurs des indices fondamentaux de la propagation ionosphérique, ont été établis par le Secrétariat spécialisé du Comité consultatif international des radiocommunications (CCIR) conformément à la Résolution 4-1, à l'Avis 371 et au Rapport 246-1 de la XIe Assemblée plénière du CCIR (Oslo, juin-juillet 1966).

VALEURS OBSERVÉES :

● R_{12} (moyenne glissante sur douze mois du nombre de taches solaires) :

Année \ Mois	1	2	3	4	5	6	7	8	9	10	11	12
1965	12	12	12	13	15	15	16	17	19	21	23	25
1966	29	32	35	38	41	45						

● I_{F_2} (indice ionosphérique)* :

Mois (année 1965).

1	2	3	4	5	6	7	8	9	10	11	12
7	5	20	18	10	15	17	12	9	6	6	—1

Mois (année 1966).

1	2	3	4	5	6	7	8	9	10	11	12
15	20	34	37	46	54	54	53	37	46	64	68

(*) Dans le cas où la valeur de l'indice I_{F_2} est suivie de chiffres entre parenthèses, ces derniers indiquent le nombre de valeurs de *fo*F2 qui ne sont pas encore parvenues au Secrétariat du CCIR et dont, en conséquence, on n'a pas tenu compte dans le calcul de cet indice. Pour plus de détails, voir le Journal des Télécommunications (avril 1964, page 119 et janvier 1966, pages 43-47).

● Φ (flux du bruit solaire moyen mensuel) ** :

Année \ Mois	1	2	3	4	5	6	7	8	9	10	11	12
1965	78	75	74	72	78	77	74	75	76	80	76	76
1966	88	84	90	97	98	96	107	107	111	109	113	125

(**) Renseignements obligeamment fournis par le « National Research Council », Ottawa.

PRÉVISIONS :

● R_{12} *** :

Année \ Mois	1	2	3	4	5	6
1967	65	68	71	74	76	79

(***) Renseignements obligeamment fournis par le professeur Waldmeier, Observatoire fédéral de Zurich.

Estimation de l'erreur sur les prévisions, six mois d'avance de R_{12} : $\pm$ 25.

● I_{F_2} ****

Année \ Mois	12	1	2	3	4	5	6
1966	63						
1967		66	70	74	78	82	(86)

(****) Renseignements obligeamment fournis par le « Department of Scientific and Industrial Research, Radio and Space Research Station», Slough.

La valeur prévue six mois à l'avance est donnée entre parenthèses.

ERREUR MOYENNE SUR LES PRÉVISIONS DE I_{F_2} BASÉE SUR LES 12 MOIS PRÉCÉDENTS :

Temps de prévision (mois)	0	1	2	3	4	5	6
Erreur moyenne	—3,9	—2,4	—1,8	1,2	—0,1	+1,1	+2,5
Ecart-type de l'erreur	±9,3	±13,8	±14,3	±14,6	±15	±14,9	±14,5

● Φ *****

Année \ Mois	12	1	2	3	4	5	6	7	8	9
1966	120									
1967		125	(129)	(134)	(139)	(144)	(150)	(155)	(161)	(167)

(*****) Prévision selon une méthode d'extrapolation envisagée au Secrétariat du CCIR en application de la Résolution 30 de la XIe Assemblée plénière du CCIR (Oslo, 1966). Pour les valeurs mises entre parenthèses, l'erreur dépasse probablement la valeur de ± 10 unités de Φ.

Erreur moyenne sur les prévisions de Φ basée sur les 12 mois précédents :

Temps de prévision (mois)	0	1	2	3	4	5	6	7	8	9
Erreur moyenne	—0,3	—2,1	—3,3	—5,1	—6,8	—7,9	—8,8	—8,4	—7,0	—4,2
Ecart-type de l'erreur	±7,4	±7,4	±8,9	±9,9	±10,6	±12,2	±14,9	±16,6	±19,9	±20,6

SOLAR INDICES FOR IONOSPHERIC PROPAGATION

(Reprint from *Telecommunication Journal*, Vol. 34, No. 1, January 1967)

The following tables, giving values of the basic indices for ionospheric propagation, have been prepared by the Specialized Secretariat of the International Radio Consultative Committee (CCIR) in accordance with Resolution 4-1, Recommendation 371 and Report 246-1 of the XIth CCIR Plenary Assembly (Oslo, June-July 1966).

PARAMETERS :

● R_{12} (smoothed mean, over twelve months, of the number of sunspots observed) :

Year \ Month	1	2	3	4	5	6	7	8	9	10	11	12
1965	12	12	12	13	15	15	16	17	19	21	23	25
1966	29	32	35	38	41	45						

● I_{F_2} (ionospheric index) * :

Month (year 1965).

1	2	3	4	5	6	7	8	9	10	11	12
7	5	20	18	10	15	17	12	9	6	6	—1

Month (year 1966).

1	2	3	4	5	6	7	8	9	10	11	12
15	20	34	37	46	54	54	53	37	46	64	68

(*) When the value of the I_{F_2} index is followed by figures in brackets, the latter refer to the number of values of *fo*F2 which have not yet reached the CCIR Secretariat and which have not therefore been taken into account in the calculation of the index. For further details, see the Telecommunication Journal, April 1964, page 119, and January 1966, pages 43-47.

● Φ (monthly mean value of solar noise flux) ** :

Year \ Month	1	2	3	4	5	6	7	8	9	10	11	12
1965	78	75	74	72	78	77	74	75	76	80	76	76
1966	88	84	90	97	98	96	107	107	111	109	113	125

(**) Data kindly supplied by the National Research Council, Ottawa.

FORECASTS :

● R_{12} ***

Year \ Month	1	2	3	4	5	6
1967	65	68	71	74	76	79

(***) Data kindly supplied by Professor Waldmeier, Federal Observatory, Zurich.

Estimated error in forecasts of R_{12} six months in advance : $\pm$ 25.

● I_{F_2} ****

Year \ Month	12	1	2	3	4	5	6
1966	63						
1967		66	70	74	78	82	(86)

(****) Data kindly supplied by the Department of Scientific and Industrial Research, Radio and Space Research Station, Slough.

The figure in brackets is the value forecast six months in advance.

MEAN ERROR IN I_{F_2} PREDICTIONS CALCULATED OVER THE 12 PRECEDING MONTHS :

Period of prediction (months)	0	1	2	3	4	5	6
Mean error	—3.9	—2.4	—1.8	1.2	—0.1	+1.1	+2.5
Standard deviation of the error	±9.3	±13.8	±14.3	±14.6	±15	±14.9	±14.5

● Φ *****

Year \ Month	12	1	2	3	4	5	6	7	8	9
1966	120									
1967		125	(129)	(134)	(139)	(144)	(150)	(155)	(161)	(167)

(*****) Prediction by a method of extrapolation devised by the CCIR Secretariat, pursuant to Resolution 30 of the XIth CCIR Plenary Assembly (Oslo, 1966). For the values in brackets, the error probably exceeds the value of ± 10 units of Φ.

Mean error in Φ predictions calculated over the 12 preceding months :

Period of prediction (months)	0	1	2	3	4	5	6	7	8	9
Mean error	—0.3	—2.1	—3.3	—5.1	—6.8	—7.9	—8.8	—8.4	—7.0	—4.2
Standard deviation of the error	±7.4	±7.4	±8.9	±9.9	±10.6	±12.2	±14.9	±16.6	±19.9	±20.6

Commission VI on Radio Waves and Circuits

INTERNATIONAL SYMPOSIUM ON INFORMATION THEORY

Letter to the Official Members of Commission VI

The Board of URSI has decided during its meeting of February 7-9, 1967 that the International Scientific Radio Union will sponsor or co-sponsor the three Symposia proposed by our Commission.

The International Summer School on Network Theory 1968 in Prague, Czechoslovakia is considered an exceptional case and

will therefore be co-sponsored by URSI. In general URSI will not sponsor summer courses.

The International Symposium on Electromagnetic Wave Theory in Stresa, 1968 will soon circulate its programme.

* * *

The International Symposium on Information Theory in Athens, Greece, September 11 to 15, 1967 is co-sponsored by URSI and the IEEE. King Constantine of the Hellenes will be Patron of this Symposium.

Topics to be covered include :

Coding and decoding for discrete and continous channels and signal design. Detection theory. Pattern recognition. Learning and Adaptive systems. Application to biological systems. Prediction and filtering theory and noise theory including random field theory. Papers are invited in these and related fields. There will be two kinds of contributed papers : the « long » papers of 30 minute duration and the « short » papers of 15 minute duration. The long papers will be accepted on the basis of the complete manuscript; the short papers will be accepted on the basis of a 200 word abstract.

Please note change of deadline.

The deadline for the submission of all manuscripts and abstracts has had to be changed to April 1, 1967. Acceptances and rejections will be made by May 1, 1967, and authors will be notified promptly thereafter in order to give them time for their travel preparations. It has been necessary to change the deadline, because the original deadlines (May 1 and June 1) were to late for some authors who could only reserve hotels etc., after they knew that their lecture had been accepted. However, if some of you have planned on the original deadline, please notify me of your subject, and whether it regards a long or a short paper, before April 1, 1967, and I will see what can be done.

All manuscripts in English should be sent to R. F. Drenick, Dept. of Electrical Engineering, Polytechnic Institute of Brooklyn, 333 Jay Street, Brooklyn, N. Y. 11201, USA.

All manuscripts in Russian should be sent to M. S. Pinsker, Aviamotornija 8^a, Kopn 2, Academy of Sciences USSR, Moscow E-29, USSR.

All manuscripts in French should be sent to my address.

September 11, 12, 14, 15 : Technical Sessions.

September 13 : Excursion.

Some of the best known authorities in East and West have been invited to address the participants on their latest works !

Symposium participants may make hotel reservations in Athens by writing to BTS (Information Theory Symposium), 10 Stadion Street (R. 101), Athens 133, Greece. Hotel prices per day including room, breakfast, one meal, service and taxes (all rooms with private bath) go from $ 6.50 (tourist class) to $ 25.00 (de luxe class). Reservations will be made in hotels within walking distance from the « King's Palace Hotel » where the Symposium will be held. Significant reduction in price is possible, when no meals are taken in the hotel.

We thank the Greek National Committee President, professor Anastassiades, for his cooperation.

We also thank those of you, especially professor Roubine, who have already notified me of their interest or sent a circular letter to those probably interested in their own country. I would be very interested in receiving names of likely participants.

Please note the following changes of address :

Professor E. Roubine, Faculté des Sciences de Paris, Ecole Supérieure d'Electricité, 10 Avenue Pierre Larousse, 92, *Malakoff* (France).

Mr. J. Mawdsley, Physics Department, Victoria University, Salamanca Road, Wellington, W1, New Zealand.

Mr. Mawdsley is the new Official Member for New Zealand.

Sincerely yours,

Dr. F. L. Stumpers,

Philips Research Laboratories
Eindhoven
(The Netherlands)

CONFERENCE ON NON-LINEAR OSCILLATIONS

The Czechoslovak Academy of Sciences, the German Academy of Sciences and the Polish Academy of Sciences regularly organize conferences on non-linear oscillations. The first conference took place in Prague in 1960, the second in Warsaw in 1962 and the third in Berlin in 1964.

The fourth conference is to be held in Prague again. The Czechoslovak Academy of Sciences has entrusted the Institute of Radio Engineering and Electronics with the organization of this Conference, which will take place in the building of the Technical University and will last from the 5th to the 9th September 1967. At the plenary session of the Conference the main survey reports on non-linear oscillations and further reports will be delivered in the following sections : (i) mathematical theory of non-linear oscillations, (ii) application to mechanics, and (iii) application to electrical engineering. The reports may be delivered in one of the following languages : Czech, German, Russian and English.

For the participants as well as for their company a cultural program (sightseeing in Prague and its surroundings, visit of theatres and cultural gatherings) will be prepared.

The Organizing Committee believe that you will find the contents of the Conference attractive and thus will consider the possibility of attending it.

Further information will be issued later on.

Sergej Djad'kov,

Chairman of the Organizing Committee
Ustav Radiotechniky A Elektrotechniky
CSSR
Praha 8, Lumumbova 1, CSSR.

COLLOQUIUM ON INFORMATION THEORY

A Colloquium on Information Theory organized by the Bolyai Janos Mathematical Society, will be held in Debrecen (Hungary), September 19-24, 1967.

The Colloquium will deal with the following topics :

(1) Foundations of information theory.
(2) Coding theorems.
(3) Coding theory and design techniques.
(4) Applications of information theory in probability and statistics.
(5) Theory of search.
(6) Statistical communication and control theory.
(7) Applications of information theory in linguistics.
(8) Applications in biology.
(9) Applications in physics.
(10) Applications of information theory in other branches of mathematics (e.g. ergodic theory, etc.).

Further information available by the Secretary of the Organizing Committee, Dr. K. Bognar. Szabadsag Tér 17.II, EM. 202, Budapest V, Hungary.

Commission VII on Radio Electronics

SYMPOSIUM ON TEST METHODS AND MEASUREMENTS OF SEMI-CONDUCTOR DEVICES

The Hungarian Academy of Sciences, Department of Technical Sciences of Hungary, and the Hungarian Scientific Society for Telecommunication sponsor jointly a Symposium on Test Methods and Measurements of Semi-Conductor Devices, Budapest, April 25-28, 1967.

The specialized subjects dealt with at the Symposium are :

— Methods of testing junction devices.
— Methods of testing majority carrier devices.
— Measuring equipments.
— Reliability of semi-conductor devices.
— Methods of testing semi-conductor materials.

Administrative Secretariat of the Symposium : Technika Haza, Budapest V, Szabadsag tér 17, Hungary.
Code address : Semidevice Budapest.

URSI-CIG Committee

MINUTES OF SIXTH MEETING

The sixth meeting of the URSI-CIG Committee was held in Munich during the XV General Assembly of URSI. Three sessions were held, on September 7, 12, and 13, 1966, at which the following members were present :

Prof. W. J. G. Beynon (*Chairman*).
Mr. G. M. Brown (*Secretary*).
Prof. W. Dieminger.
Prof. R. A. Helliwell.
Prof. C. O. Hines.
Mr. F. Horner.
Prof. E. A. Lauter.
Dr. C. G. Little.
Prof. M. G. Morgan.
Mr. W. R. Piggott.
Prof. K. Rawer.
Mr. A. H. Shapley.
Mr. J. Voge.
Prof. R. W. H. Wright.

The following also attended one or more of the sessions by invitation :

Prof. H. G. Booker.
Prof. S. A. Bowhill.
Dr. K. Davies.
Prof. J. Delloue.
Mr. F. du Castel.
Dr. H. Friedman.
Dr. F. S. Johnson.
Mr. R. W. Knecht.
Dr. C. M. Minnis.
Dr. G. M. Pillet.
Prof. H. C. Webster.

1. — Publications

(*a*) *Revised Atlas of Ionograms.*

Mr. A. H. Shapley outlined the present position with regard to the publication of the Revised Atlas of Ionograms. Compilation

by Mr. J. W. Wright had been delayed for a variety of reasons, but the Atlas was now about 80 % assembled. The contents had been planned on a comprehensive scale, to include sample ionograms for noon and midnight in summer, equinox, and winter for about 80 stations, and miscellaneous ionograms illustrating special sequences of interest etc.

There was general agreement that the project should still be pursued and publication achieved as rapidly as possible. The lack of an up to date set of reference ionograms in training workers is serious. Efforts should be made to include some examples of recent ionograms where available, since few in the present compilation are post-1963. Mr. Shapley undertook responsiblity to finalise the Revised Atlas at the earliest possible date.

(*b*) *Ionospheric Stations Manual Supplement.*

Mr. G. M. Brown reported that the Supplement to the URSI Manual of Ionospheric Stations had been published in September 1964, and distributed free of charge on request to all purchasers of the original Manual. Details of modifications to data for 129 vertical incidence stations and 41 new stations are included in the Supplement.

(*c*) *N(h) Monograph.*

Mr. A. H. Shapley exhibited a copy of the full manuscript of the Monograph on N(h) Analysis which had been completed by Mr. J. W. Wright. Members recommended that the USA National Committee for URSI and ESSA be urged to publish this Monograph as rapidly as possible, preferably in the journal « Radio Science ».

Since it was understood that Taieb's method of N(h) analysis will be used in tabulations of data for some French stations, it was agreed that Mr. Taieb should be asked to provide a short summary of his method to be included in the Monograph, giving reference to the detailed paper which had been published in a French journal.

(*d*) *IGY Ionosphere Data.*

Prof. K. Rawer reported that the IGY Ionospheric Drifts Data had been published in Volume 33 of the *IGY Annals.*

Mr. W. R. Piggott stated that the IGY Ionospheric Absorption Data had not yet been published, and it was suggested that the projected IQSY Data Review Paper (see next entry) for absorption,

which would summarise IGY and IQSY results, might be more appropriate than mere tables of figures. This would be prepared by Prof. Rawer, in consultation with Mr. Piggott.

The desirability of publishing a comprehensive list of all IGY ionospheric data published in the *IGY Annals* was expressed, and the Secretary undertook to prepare such a list for the URSI Information Bulletin.

(*e*) *IQSY Ionosphere Data.*

Dr. C. M. Minnis outlined the plans agreed by the IQSY Bureau for the publication of IQSY data. One volume of the *IQSY Annals* would be devoted to « data review papers » for the ionosphere discipline, which would contain fairly extensive summaries describing the data obtained with sample comparisons with the IGY period, etc. The Reporter for Ionosphere, Prof. Dieminger, had recommended the following three Data Review Papers, and the authors had all agreed to act :

Vertical Incidence Soundings : G. M. Brown, in consultation with W. R. Piggott and R. W. Knecht.

Ionospheric Absorption : K. Rawer, in consultation with W. R. Piggott.

Ionospheric Drifts : R. W. H. Wright.

Manuscripts for these papers should be in the hands of the IQSY Secretariat by the end of 1967.

(*f*) *Other IQSY Information.*

Prof. K. Rawer reported that the collection of details on IQSY ionosondes was in hand, and the information would be published in the URSI Information Bulletin. Dr. C. M. Minnis anticipates replies to questionnaires sent to ionospheric stations by the summer of 1967, from which detailed IQSY Ionospheric Stations Lists will be compiled.

2. — Reports of Sub-Discipline Consultants

(*a*) *Vertical-incidence Soundings.*

Mr. W. R. Piggott summarised the IQSY experience in the field of vertical soundings. The position was generally satisfactory, although the standards of observing had not been as good as during the IGY. About the same total amount of data could be anticipated. The number of stations which operated was 158 $\pm$ 6. The flow of data to W. D. Cs. was much better than for the IGY.

(*b*) *Absorption A1/A3.*

Prof. K. Rawer reported on the IQSY absorption work. The geographical coverage for method A1 was not so satisfactory as for the IGY, but the possibility exists for a good comparison between the two periods. Method A3 has real promise and appears to have given much better information than hitherto.

The importance of absorption measurements was stressed in view of the now well-established stratospheric coupling relationship, and a proposal that a special programme be undertaken as a post-IQSY special project was supported, and adopted as a formal Resolution of the Committee (see Resolution 1 below). In this context note should be taken of the stratwarm alerting system which was brought into operation at the beginning of the IQSY. It was felt that there is a need to devise a mechanism for sharing views and disseminating information on what synoptic observations are being undertaken.

(*c*) *Absorption A2.*

Dr. C. G. Little reported that the main features of the absorption A2 programme during the IQSY had been multi-frequency work and conjugate point studies. There had been little cooperation between groups, and there was an increasing need to encourage organizations to send their data to the W. D. Cs. The riometer method is primarily of use at high latitudes, since the noise level at the frequencies which must be used at middle and low latitudes is generally too high.

(*d*) *Drifts.*

Prof. R. W. H. Wright stated that the IQSY work on ionospheric drifts had been increased in the equatorial region since the IGY, but elsewhere it had been decreased. Several stations had undertaken comparisons between different methods (D1/D2, D1/D4, etc.) which was valuable. In fact, special studies are really important for the future development in this field. Data flow to W. D. Cs has been slow.

(*e*) *Atmospheric Radio Noise.*

Mr. F. Horner reported that the stimulus given to studies of atmospheric radio noise during the IGY had remained, and work had continued more or less at the same level since. The long-

term programme had yet to be considered, and the usefulness of the W. D. Cs in this particular field was questionable. It was noted that it had been deciced at the present Assembly to create a new provisional URSI Commission VIII for this subject.

(*f*) *Whistlers and VLF Emissions.*

Prof. R. A. Helliwell reported that synoptic efforts in this field had continued during IQSY for selected stations, but on a small scale relative to that during the IGY.

(*g*) *Oblique-incidence Soundings.*

Dr. K. Davies presented a report on a meeting on oblique-incidence soundings of the ionosphere which was held at Leicester, England, in July 1966 during the Conference on Ionospheric Radio Propagation near the L. U. F. Following a discussion some amendments to the report were agreed. The text is attached as Appendix I. It was agreed to refer the question of recommending a standard format for the graphical representation of electron density profiles to the Sub-Committee on N(h) Profiles.

3. — Sub-Committee on Data Processing

At the III IQSY Assembly held in Madrid in March 1965 the following recommendation was made by the Working Group for Ionosphere (see URSI Bulletin No. 151 (1965) p. 36).

« The Working Group recommends that URSI be invited to consider setting up a sub-committee of the URSI-CIG Committee to deal with data processing under the interim chairmanship of Professor K. Rawer for the following purposes :

(*a*) to expedite collaboration and discussion between workers in different organizations on problems of automatic methods of obtaining and processing the data obtained by pulse methods;

(*b*) to encourage the development of such methods for the handling of ionospheric data ».

Professor Rawer reported that he had circulated a document on ionospheric data processing to interested workers and was awaiting replies before setting up the proposed new Sub-Committee. The text of the document circulated is given in Appendix II.

4. — World Data Centres for Ionosphere

Mr. A. H. Shapley stated that reports indicated that the W. D. Cs for Ionosphere were operating satisfactorily. Responsibility for overall supervision and coordination of the work of Ionosphere W. D. Cs will be assumed by the new Inter-Union Commission on Solar-Terrestrial Physics. A general resolution on data flow to W. D. Cs was agreed : see Resolution 2.

The attention of those concerned was called to certain requests concerning the submission of ionograms and absorption and drift tables to W. D. Cs given in Appendix III.

5. — Matters relating to the IUCSTP

Consideration was given to letters received by URSI and referred to the URSI-CIG Committee from the President (Dr. H. Friedman) and the Acting Secretary (Dr. C. M. Minnis) of the Inter-Union Commission on Solar-Terrestrial Physics. These invited the views of URSI on the proposed activities of this Commission and on a provisional list of discipline representatives.

Dr. Friedman outlined the circumstances under which the new IUCSTP had been established, and the structure under which it was proposed to operate. There would be six discipline areas as follows : solar activity; particles and fields in interplanetary space; radiation belts, aurora and airglow; geomagnetism; ionosphere; aeronomy. The place of the magnetosphere in this scheme was queried, and Prof. Booker felt that there was a broad area concerned with particles and wave interaction in the magnetosphere which was not adequately covered at present (This matter was to be the subject of a Resolution of Commission IV at the present Assembly). It was observed that meteorology seemed to be excluded, although some members felt that meteorology could justifiably be included in the general expression « solar-controlled disciplines of geophysics » which is used in defining the terms of reference of the IUCSTP.

Dr. Friedman said that the activities of the Commission for the forthcoming solar maximum period will be developed by small working groups, which will report to the relevant Unions :

e.g. the Solar Flare Project is being undertaken by a group reporting to the IAU. He conceives the IUCSTP as a kind of clearing house through which activities can be channelled to the correct Unions or Working Groups.

The Chairman stressed that the main concern of the URSI-CIG Committee has been ground-based radio observations, and the relevance of these to the IUCSTP should be considered. It was suggested that some study programmes should be inaugurated to compare solar maximum and minimum conditions on the basis of ground-based observations. The importance of not separating ground-based measurements from satellite work was also stressed.

It was pointed out that there was always a continuing need to know the normal properties of the atmosphere, apart from those during special events. The collection of normal data was always less exciting than that for particular events, but it calls for international effort. In reply, Dr. Friedman agreed and said his Commission would welcome suggestions for synoptic observations. Although it was probably true that in the field of solar-terrestrial physics the existing normal activities in the synoptic and patrol categories will suffice, continuing attention to the scale and quality of synoptic observations is vitally necessary. Dr. Friedman said that his Commission would look to members of the URSI-CIG Committee for advice on radio observations of the synoptic kind, and they would take due note of any suggestions made. In fact, the IUCSTP was not to be regarded as a scientific directorate, but it would depend on input from scientific personnel.

In reply to an enquiry whether the Commission had considered forming a panel concerned with predictions of solar activity, Dr. Friedman said that, in his view, the IUCSTP was to be primarily concerned with scientific activities rather than services. Prof. Dieminger reported that the WMO has a close interest in the IUCSTP. Dr. Friedman stated that there will be representation on the IUCSTP of the WMO, SCAR, and the WDC organization, amongst others. Representation would not, in general, be planned on national or regional bases. However, the desirability of including some workers in the southern hemisphere in the discipline representation was expressed. Consideration was given to the list of discipline representatives circulated to the Unions for comment by the President of the IUCSTP, and, after discussion, it was

agreed to refer this matter to the Presidents of Commissions III and IV and the URSI representative on IUCSTP.

6. — Future of Committee

The Chairman reminded members of the terms of reference of the URSI-CIG Committee. Originally established in 1960 the membership of the Committee was drawn from URSI Commissions II, III, IV, and V and it had concerned itself with the interests of URSI in the activities of the CIG and, more recently, in the work of the IQSY. In 1967 both CIG and the Special Committee for the IQSY will terminate and the work of both these Committees will be taken over by the new Inter-Union Commission on Solar-Terrestrial Physics. Clearly, much of the work of IUCSTP will be of direct concern to URSI and it was necessary to consider how the Union could best cooperate with the new Inter-Union Commission.

After a full discussion it was agreed to recommend to the URSI Executive Committee that the URSI-CIG Committee be dissolved in 1967 at the time of dissolution of CIG and of the Special Committee for the IQSY. It was further recommended that a new URSI Committee on Solar Terrestrial Physics, to be known as the *URSI-STP Committee*, be formed to provide the necessary liaison with the IUCSTP, with the following terms of reference :

1. To cooperate with the IUCSTP in all matters relating to URSI in the field of solar terrestrial physics.
2. To coordinate the activities of those URSI Commissions which are especially concerned in the field of solar terrestrial physics.
3. To deal with all matters referring to the IGY and IQSY formerly considered by the URSI-CIG Committee, including the flow of data to WDCs and the publication of data, including the IGY and IQSY data, in the field of radio science.
4. To integrate URSI special programmes of research to be planned under the IUCSTP, and to coordinate and present the views of URSI on symposia in the solar terrestrial physics field.

Various members stressed the fact that within the general field of solar terrestrial physics there are often topics of interest to several URSI Commissions and it was highly desirable to have within the Union a Committee at which these matters could be

discussed, and through which a unified URSI approach could be made to IUCSTP. In this connection Professor Booker expressed the view that the existing Working Group of Commission IV on Synoptic Whistlers should become a Sub-Committee of the new URSI-STP Committee. It might also be appropriate to have other Sub-Committees on ionospheric topics and on World Data Centres.

It was agreed that recommendations on the membership of the proposed URSI-STP Committee should be made by the Chairmen of Commissions II, III, IV and V, with the URSI representative on IUCSTP (Prof. Beynon) as convener, and should include the Chairmen and Vice-Chairmen of Commissions II, III, IV, V, and the new provisional Commission VIII. It would probably be necessary for the URSI-STP Committee to meet before the next URSI General Assembly.

The attention of all members is drawn to the resolutions and recommendations formulated by Commission III during the Munich Assembly. Most of these are of direct concern to the activities of the Committee; some of them call for action by the Committee.

The full texts of the recommendations were published in URSI Information Bulletin No. 159, pp. 5-18 (French), 20-23 (English). The topics concerned are :

1. Ionospheric observation network.
2. Observations for ionospheric and solar indices.
3. Propagation by ducting above the ionization maximum of the F region.
4. Physical nature of sporadic E.
5. Distribution and location of ionospheric sounding stations.
6. Reference ionosphere.
7. Working group on ionospheric drift reduction.
8. Symposium on ionospheric drifts.
9. Nomenclature for topside ionospheric sounding.
10. Ionospheric absorption measurements.
11. Measurement of ionospheric drift.

W. J. G. Beynon, *Chairman*
Geoffrey M. Brown, *Secretary.*

Resolutions

Resolution (1).

Investigations carried out during the past years have shown that there is some relationship between the occurrence of stratospheric warmings and anomalous absorption of radio waves in the D-region during winter, thereby establishing for the first time a correlation between stratospheric, mesospheric, and ionospheric phenomena. In common with recommendations of the COSPAR Working Group II and of the Advisory Council of the WMO, the URSI-CIG Committee strongly *recommends* further investigation of these correlations with a view to establishing the mechanism of interaction and the long-term solar activity influences on the phenomena.

It is noted that, beginning with the IQSY, STRATWARM Alerts are issued as appropriate for both hemispheres, under the auspices of the IUWDS in cooperation with the WMO, to give timely alerts of the existence, location, and movement of centres of unusual warming in the stratosphere.

The URSI-CIG Committee proposes the following investigations as a special post-IQSY study programme. Contacts between interested groups should be established through the Reporter for Ionosphere.

(1) Continuous ground-based observations of absorption of radio waves in order to establish the temporal and local variations, especially during winter. These observations should be used as a guide for determining the time for more expensive investigations, such as by rockets.

(2) Determinations of the electron density profile in the D region from ground-based radio observations.

(3) Measurements of electron and ion density, and ion and neutral gas composition, in the D-region by rocket-borne intruments.

(4) Measurements of the collision frequency profile in the D-region.

(5) Observations of meteorological parameters of the stratosphere by balloons and of the mesosphere and lower ionosphere by small meteorological rockets.

Resolution (2).

The URSI-CIG Committee *recommends* that all institutions making radio observations contributing to international program-

mes, including IGY and IQSY, continue to forward copies of their data to the World Data Centres in accord with the CIG Guide and the various URSI recommendations. It is especially urged that all IQSY data be transmitted as soon as possible.

Appendix I.

Oblique Soundings of the Ionosphere

The following recommendations were made by an ad-hoc Working Group meeting at Leicester on 30 July 1966 under the Chairmanship of Dr. K. Davies.

1. — Standardization.

1.1. — *Description of Oblique Ionograms.*

The working group noted that the CCIR Study Group VI (Doc. VI/1030-E, 1966) has made the following recommendation : « that users of predictions should familiarize themselves with the new terminology, recommended by the URSI, which is already in limited use, with the hope that it might ultimately replace the old terminology ».

It was recognized that lack of familiarity with the recommendations of an earlier meeting at Lindau (URSI Information Bulletin No. 143, p. 54, 1964) have limited their adoption. It is recommended, therefore, that the reports of the Lindau and Leicester meetings be published in journals having broad circulations.

1.2. — *Qualifying Symbols.*

In interchanging oblique-sounding data, there is a need for symbols to qualify numerical values. It is recommended that, wherever possible, the standard qualifying letters used for vertical soundings (see Piggott and Rawer, 1961) should be employed with oblique data. A measure of the scaling accuracy should accompany such data.

1.3. — *Data Interchange.*

Wherever possible, oblique-sounding data should be deposited in World Data Centres.

1.4. — *Description of Oblique Paths which Involve Backscatter.*

It is recommended that the method of describing path geometry for forward propagation, devised at Lindau in 1963, be extended to cover the case of backscatter as follows.

The region of the ionosphere where scattering occurs is indicated by placing an oblique (/) after the letter designating it. When the scattering is at the ground, a hyphen should precede it.

The hops should be specified in order of distance from the transmitter. When a returned ray does not retrace the forward path, the return path should be indicated following the oblique (See R. R. Bartholomew, 1966).

A double oblique should be used when the backscatter returns the energy directly to the receiver.

When the order of the hops is known, they should be indicated sequentially; whereas if only the total of hops from each reflecting layer is known, they should be indicated by a number preceding the layer designation.

The letters L and H may be used, after the letter designating the layer, to indicate low-angle and high-angle rays. For example, the path FH-/FL represents a one-hop high-angle reflection from the F layer followed by backscatter from the ground and returned to the receiver via the low-angle F path.

2. — *Ray Tracing : Numerical Parameters.*

For intercomparison of various ray-tracing programs it is recommended that the following numerical values be used :

(*a*) Radius of the earth = 6370 km.

(*b*) Velocity of radio waves in free space = 2.997925×10^5 km/sec.

(*c*) When the earth centred dipole approximation is used :
North dipole pole = 78.50° N, 291° E.
Field strength at the earth's surface at the equator = 25 ampere turns per metre (see Mlodnosky and Helliwell, 1962).

3. — *Applications to Communications Systems.*

3.1. — Considering the increase in the number of oblique-sounders, it is requested that all operators of such equipment provide the following information to the URSI-CIG Reporter for Ionosphere (Dr. W. Dieminger) for suitable dissemination :

(*a*) transmitter and receiver locations.

(*b*) schedules : sweep duration, etc.

(*c*) equipment characteristics : peak power, pulse duration, pulse repetition frequency, antennas, etc.

(*d*) wave parameters currently being measured.

The Working Group noted that the Defense Communications Agency, DCA, Code 311, Washington, DC 20305, currently provides a catalogue of sounder locations and schedules. This includes, but is not limited to, all sounders participating in the Common User Radio Transmission Sounding (CURTS) System. The DCA is prepared to include information provided by other operators on request.

A comprehensive catalogue of this nature is highly desirable in order to minimize mutual interference.

3.2. — It is recommended that the following propagation characteristics of individual rays be measured wherever possible, in addition to the standard measurements of maximum observed frequency (MOF) and lowest observed frequency (LOF) :

(*a*) signal amplitude,

(*b*) Doppler frequency shifts,

(*c*) vertical and azimuthal angles of arrival,

(*d*) ionospheric characteristics along the path (e.g. true height, peak-electron density, layer thickness).

REFERENCES

BARTHOLOMEW, R. R., 1966. — A proposed terminology for ionospherically propagated backscatter modes, Stanford Research Institute.

MLODNOSKY, R. F. and HELLIWELL, R. A., 1962. — Graphic Data on the Earth's Main Magnetic Field in Space. *J. Geophys. Res.*, **67**, 2207.

PIGGOTT, W. R. and RAWER, K., 1961. — URSI Handbook of Ionogram Interpretation and Reduction, Elsevier Publishing Company, Amsterdam.

Appendix II.

Automatic Data Handling for Ionospheric Pulse Measurements

Ionospheric pulse data are used to give information about pulse amplitude, polarization and pulse delay time. A special problem arises with drift observations where a certain number of amplitude data must be analysed as a whole in order to obtain effective or average time differences.

In the classical recording sets this information is stored in a completely analog form. In such cases reduction of records implies reading numerical values out of analog patterns such as photographic luminosity records or similar devices. In the most important application, viz. ionograms, the reduction implies also the identification of certain echo traces, and interpolation or extrapolation to certain characteristic frequency or height values. These procedures have been described in detail in the « URSI Handbook for Ionogram Interpretation and Reduction » (Piggott-Rawer).

When it is intended to obtain such information by an automatic method, difficulties of a different kind are met. We may distinguish two sorts of approaches, namely analog records which are easier to reduce than the classical ones (as a first step) and numerical records (as a final step). Digitalizing is needed between both steps but this is not the only logistic operation which must be fulfilled.

In the following we try to give a survey in a very preliminary form, beginning with easy tasks for automatic data gathering and proceeding to the more complicated cases.

1. — *Direct measurements.*

1.1. — *Amplitude recording* is the easiest input for digitalization and has been applied at several places. It is, of course, important that the receiver reproduces the amplitude of the pulses in an unambiguous manner. If this is so, after a suitable gate, the amplitudes can be read in a certain number of classes by a set of switching devices with increasing input level. In most cases this set will be arranged with equal dB steps. After digitalizing, the values can easily be transformed into a binary or decimal indication of the amplitude.

It should be mentioned that instanteous amplitude values are almost meaningless, so that a rather large number of amplitudes has to be compared and a suitable median value must be determined. Therefore, an amplitude recording device must contain a memory in one form or other.

1.2. — *Polarization data* can be obtained from amplitude readings, for example by comparison of two amplitudes. The tools needed could be similar to those mentioned above under 1.

1.3. — *Virtual height records* can be digitalized by comparison with a standard frequency pulse series, after synchronization with the direct pulse. Experience shows that this synchronization may introduce considerable errors. Another source of errors arises from amplitude variations and, in particular, from selective fading. Without special devices it cannot be expected that pulse delay digitalization is completely free of error.

2. — Sophisticated measurements.

2.1. — *Ionogram reduction.* Apart from delay-time observations required in the reduction of ionograms, interpretation is needed. At first the echoes must be confined to echo traces following the frequency axis. While this operation could be done more or less adequately by an automatic device throwing out isolated echoes, the identification by completely automatic methods of the o-, x- and z-traces is considerably involved. Moreover, the first echo has also to be distinguished from multiple echoes (for example, distinction between 2Es and F). At the present time no automatic solution is in view, and it must probably be accepted that a human individual identifies the traces before or after the digitalization.

Another difficulty stems from the interpolation and extrapolation procedures which are essential to reach physically significant reduction data. It is dangerous to reduce the accuracy of these procedures arbitrarily, merely because an automatic device is not able to do better.

Another problem arises in the use of non-numerical indications which are so helpful in ionospheric routine reduction.

2.2. — *Real height analysis* could be obtained directly from digitalized records. The very different methods which have been

used to this end starting from photographic records should be rediscussed. As the quantity of data is large, economic solutions are desirable. One could imagine that from a digitalized record an electron density profile could be obtained either as a curve (or column) of numerical values, or as a limited set of numerical parameters characterizing the profile.

2.3. — *Drift records* obtained with the fading method are certainly suitable for digitalization. Different approaches are known. The main step is to determine a representative time delay between two series of amplitude values. The large variability of such data allows the use of quite limited accuracy in the individual operations. A significant drift vector can only be obtained from a large number of fades.

3. — Processing of data.

This can easily be done with existing digital computation methods once the measurements are digitalized. On the other hand, analog processing offers some novel devices which could be applied with suitable analog input data, but not so easily with photographic records.

This survey indicates some of the problems which should be discussed in more detail. Interchange of ideas on partial or total solutions would be valuable. Those interested in these problems, particularly in ionospheric research, are invited to communicate their suggestions to the Interim Chairman of the Subcommittee of the URSI-CIG Committee on Data Processing : Prof. K. Rawer, Ionosphären-Institut Breisach, 7814 Breisach/FR Germany.

Appendix III.

Submission of Ionospheric Data to WDCs

The attention of those concerned is called to the following two requests.

Frequency Scales for Ionograms.

The following recommendation was made by the Working Group for Ionosphere at the III IQSY Assembly in Madrid in 1965 (see URSI Bulletin No. 151 (1965) p. 37-38).

« The Working Group recommends that stations which have or are sending ionograms to WDCs be requested to send also copies of the frequency scales in use; the scales should preferably bear dates showing the period during which they were used. Key fiduciary marks should be indicated clearly so that correct interpolations may be made when the ionograms do not match the scales accurately ».

Identification of Ionospheric Absorption and Drift Tables.

The following request is reproduced from IQSY Notes No. 15 (1965) p. 9-10.

« Experience shows that the tables of ionospheric absorptions and drift data submitted to WDCs do not always carry the appropriate symbols : A1, A2, A3 or D1, D2, D3, D4. The staff responsible for the compilation of catalogues at WDCs are not always sufficiently familiar with the scientific data to be able to identify with certainty the measurements contained in the tables received from observing stations.

It would be greatly appreciated by WDCs staff if groups which submit absorption or drift data would kindly add the appropriate symbol at the top of each table before sending it to the WDC. The symbols are :

A1 : Measurement of the amplitude of pulses reflected from the ionosphere.

A2 : Measurement of the absorption of extra-terrestrial radio noise.

A3 : Measurement of the field strength of sky wave signals at short distance and oblique incidence on frequencies suitable for obtaining absorption data.

D1 : Fading inter-comparison at three or more antennae spaced a few wavelengths apart.

D2 : Radio observations on drifting meteor trails.

D3 : Radio-star scintillation with three or more antennae spaced many wavelengths apart.

D4 : Observations of characteristic reflection features at widely spaced sites ».

INDEX TO IONOSPHERIC DATA PUBLISHED IN THE « ANNALS OF THE INTERNATIONAL GEOPHYSICAL YEAR »

At the meeting of the URSI-CIG Committee in Munich in September 1966 the view was expressed that it would be valuable to publish a catalogue of all the ionospheric data published in the « Annals of the International Geophysical Year ». The following index has been compiled in response to this request.

Of the first forty volumes of the *IGY Annals*, eight have been devoted to ionospheric data :

Vertical soundings : Vols. 13, 14, 15, 17, 18, 19.

Drifts : Vol. 33.

Whistlers and Audio Frequency Emissions : Vol. 37.

In addition, it should be noted that a complete catalogue of ionospheric data in the World Data Centres for the period of the IGY and IGC is given in Vol. 36, Section V.

In the following lists, the first two figures give the relevant Volume Number of the *IGY Annals*, and the figures after the hyphen give the page number. E. g. 13-605 refers to Vol. 13, page 605.

Geoffrey M. Brown
Secretary, URSI-CIG, Committee.

Vertical soundings

Data obtained during IGY

Hourly values of monthly medians for the following twelve parameters over the period July 1957-January 1959 are given in six separate volumes of the *IGY Annals* :

*fo*F2, *h'*F2, (M 3000) F2, *fo*F1, *h'*F, (M 3000) F1, *fo*E, *h'*E, *f*-min, *fo*Es, *fb*Es, *h'*Es.

Where two references are given for a station, the data for the whole period are published in two parts.

Adak 17-1
Ahmedabad 13-3
Akita 13-25

Alert 17-23
Alma Ata 13-47
Anchorage 13-69
Arctica I 13-91
Arctica II 13-113
Ashkabad 13-135
Baguio 17-43
Baker Lake 13-157
Bangui 17-65
Base Roi Baudouin 17-79
Belgrano 17-91
Beograd 17-97
Bogota 17-111
Bombay 13-179, 17-131
Brisbane 17-137
Budapest 13-197
Buenos Aires 17-159
Bunia 13-219
Byrd Station 17-177
Calcutta 13-237, 17-233
Campbell Island 17-239
Canberra 17-259
Cape Canaveral 17-199
Cape Hallett 17-211
Capetown 13-255
Casablanca 17-281
Chiclayo 17-291
Chimbote 13-277
Chita 13-299
Churchill 13-321
Clyde 17-311
Concepcion 17-327
Dakar 18-345
De Bilt 13-343
Decepcion 18-367
Delhi 13-365, 18-385
Dixon Island 13-383
Djibouti 18-391
Dourbes 18-409
El Cerillo 18-431

Elisabethville 13-405
Ellsworth 13-427
Eureka 18-435
Fairbanks 13-447
Fort Chimo 18-455
Fort Monmouth 13-469
Fort Norman 18-465
Fletchers Ice Island 13-513
Freiburg 13-491
Frobisher 18-469
Godhavn 18-481
Godley (Christchurch) 18-503
Gorky 13-533
Grahamstown 13-569
Grand Bahama 13-547
Graz 13-583
Halley Bay 13-605
Hobart 18-525
Hollandia 18-547
Huancayo 13-625
Ibadan 18-563
Inverness 14-3
Irkutsk 14-25
Johannesburg 14-39
Juliusruh/Rugen 14-61
Kerguelen (Port-Aux-Français) 18-585
Kiruna 14-83
Kodaikanal 14-105
Kokubunji 14-127
La Paz 18-603
La Quiaca 18-621
Leningrad 14-149
Leopoldville 14-165
Lindau 18-627
Little America 14-187
Longyearbyen 14-207
Lulea 14-229
Lwiro (Katana) 18-649
Lycksele 14-251
Macau 14-273

Macquarie Island 18-669
Madras 14-285, 18-685
Marion Island 18-691
Maui 14-303
Mawson 18-695
Meanook 18-699
Miedzeszyn 14-325
Monte Capellino 18-721
Moscow 14-333
Murmansk 14-355
Narsarssuak 14-377, 18-743
Natal 18-763
Nurmijarvi 14-397
Okinawa 14-419
Oslo 14-441
Ottawa 18-775, 19-793
Panama Canal 14-463
Paramaribo 19-797
Point Barrow 14-483
Poitiers 19-819
Pole Station 19-839
Port Lockroy 14-505
Port Stanley 14-527
Providenie Bay 15-3
Pruhonice 15-23
Puerto Rico 15-35
Quetta 15-55
Rabat 19-861
Rarotonga 19-875
Resolute Bay 19-897
Reykjavik 19-919
Rome 15-69
Rostov 15-85
St. John's 19-941
Salekhard 15-105
Salisbury 15-125
San Francisco 15-139
Sao Paulo 19-961
Schwarzenburg 15-161
Scott Base 19-983

Simferopol 15-183
Singapore 15-205
Slough 15-227
Sodankyla 15-249
Sverdlovsk 15-269
Tahiti (Orstom) 19-1001
Taipei 15-291
Talara 15-313
Tamanrasset 19-1017
Tananarive (Ivato) 19-1013
Terre Adelie (Dumont Durville) 19-1055
Thule 15-335
Tikhaya Bay 15-357
Tiruchirapalli 15-379, 19-1077
Tixie Bay 15-397
Tomsk 15-411
Tortosa 15-433
Townsville 19-1083
Trelew 19-1105
Trivandrum 15-455, 19-1117
Tromso 15-473
Tsumeb 19-1123
Tucuman 19-1143
Upsala 15-495
Ushuaia 19-1165
Victoria 15-517
Wakkanai 15-539
Washington 15-561
Watheroo 19-1177
White Sands 15-583
Wilkes 19-1199
Winnipeg 19-1217
Yakutsk 15-605
Yamagawa 15-627
Yellow Knife 19-1239
Yuzhno-Sakhalinsk 15-649

Drift observations

Obtained during IGY and IGC

References marked * are to Summary Papers, rather than Statistical Tables of results.

Ashkabad	33-243*
Bangui	33-10
De Bilt	33-26
Domont	33-34
Freiburg	33-50
Gorky	33-243*
Halley Bay	33-109, 278*
Harkov	33-243*
Irkutsk	33-243*
Jodrell Bank	33-286*
Kerguelen	33-118
Kjeller	33-271*
Kuhlungsborn	33-266*
Mayaguez	33-131
Moscow	33-243*, 258*
Murmansk	33-243*
Ottawa	33-124
Rostov-Don	33-243*
Simeiz	33-243*
Tamanrasset	33-125
Tomsk	33-243*
Tromso	33-275*
Yamagawa	33-127

WHISTLERS AND AUDIO FREQUENCY EMISSIONS

Obtained during IGY

Adelaide	37-9
Anchorage	37-17
Battle Creek	37-24
Bermuda	37-33
Boulder	37-40
Brisbane	37-49
College	37-58
Dunedin	37-64
Durban	37-70
Ellsworth	37-86
Frobisher Bay	37-95

(*) No. summaries. No whistlers, chorus, hiss, or emissions reported.

Gainsville	37-100
Godhavn	37-109
Halifax	37-118
Hanover	37-127
Hobart	37-135
Huancayo*	
Knob Lake	37-144
Kotzebue	37-148
Kuhlungsborn	37-155
Macquarie Island	37-164
Mont Joli	37-170
Moscow	37-176
Norwich	37-180
Ottawa	37-188
Poitiers	37-197
Port Lockroy	37-206
Seattle	37-215
Stanford	37-224
Toyokawa	37-233
Unalaska	37-251
Wakkanai	37-258
Washington	37-276
Wellington	37-284
Wetaskiwin	37-293

(*) No. summaries. No whistlers, chorus, hiss, or emissions reported.

INTER-UNION COMMISSIONS

IUCAF

LIST OF DOCUMENTS DISTRIBUTED TO MEMBERS OF THE INTER-UNION COMMISSION BETWEEN SEPTEMBER 1964 AND DECEMBER 1966 (DOC. 100)

Document Number	Title or Subject matter	Author or Source
IUCAF/60	List of Documents Nos. 21 to 59	—
IUCAF/61	Allocation of Frequencies for Radio Astronomy and Space Science (Reprint from Nature July 1964)	R. L. SMITH-ROSE
IUCAF/62	Progress Report for ICSU Executive Committee (June 1964)	R. L. SMITH-ROSE
IUCAF/63	Notice of meeting at Bonn	—
IUCAF/64	Record of meeting of ERFA (September 1964)	J. TRUELLE
IUCAF/65	Proposals from IAU	J. C. PECKER
IUCAF/66	Membership of IUCAF	—
IUCAF/67	Letter concerning studies of moon and OH lines by CCIR, IAU and IUCAF	J. P. HAGEN
IUCAF/68	The OH lines in radioastronomy	US National Committee to CCR
IUCAF/69	Frequency Utilisation above the ionosphere and on the far side of the moon	US National Committee to CCR
IUCAF/70	Agenda for meeting in Bonn (January 1965)	—
IUCAF/71	Membership of IUCAF	—
IUCAF/72	Report of Meeting in Bonn 12/13th January 1965	—
IUCAF/73	Letter to all members of IAU Commission 40	F. G. SMITH R. L. SMITH-ROSE
IUCAF/74	Membership of IUCAF	—

Document Number	Title or Subject matter	Author or Source
IUCAF/75	« Radio Frequencies for Space Research » — Paper to COSPAR, May 1965	R. L. SMITH-ROSE
IUCAF/76	Protection of Frequencies for Radio Astronomy	CCIR Study Group IV
IUCAF/77 (revised)	Radioastronomy and the CCIR	CCIR Study Group IV
IUCAF/78	COSPAR Resolutions at Argentina, May 1965	—
IUCAF/79	Wider distribution to radio astronomers of Doc IUCAF/73	
IUCAF/80 (revised)	Membership of IUCAF	—
UCAF/81	Notice of meeting in Rome, December 1965	—
IUCAF/82	Agenda for ditto	—
IUCAF/83	Frequencies in use at Radioastronomy Observatories	R. L. SMITH-ROSE
IUCAF/84	Draft CCIR Study Programme concerning space research	—
IUCAF/85	Draft CCIR Report on Space Research	—
IUCAF/86	Correspondence with Dr. Furstenberg on Class B frequencies	—
IUCAF/87	Registration of Frequencies for Radio Astronomy	F. G. SMITH R. L. SMITH-ROSE
IUCAF/88	Four contributions to Xth Plenary Assembly of CCIR-Oslo, 1966	US National Committee
IUCAF/89	Report on sixth meeting of IUCAF, Rome, 8/9 th December 1965	—
IUCAF/90	Contribution from IUCAF to Xth Plenary Assembly CCIR — Oslo 1966	—
IUCAF/91	« Protection of Radio Frequencies for Space Research » — Paper presented at COSPAR, Vienna, May 1966	R. L. SMITH-ROSE
IUCAF/92	Report on COSPAR Plenary Meeting, Vienna, May 1966	R. L. SMITH-ROSE
IUCAF/93	Report on meetings of IUCAF during CCIR Assembly at Oslo — June/July 1966	—
IUCAF/94	Comments from IUCAF on COSPAR submissions on frequencies for Space Research	—

Document Number	Title or Subject matter	Author or Source
IUCAF/95	Report on seventh meeting of IUCAF, Munich 12th September 1966	—
IUCAF/96	Letter concerning use of Standard Frequency Guard Bands in Radio Astronomy	R. S. LAWRENCE C. H. COSTAIN
IUCAF/97	Correspondence concerning death of Dr. J. H. D. Van Der Toorn	—
IUCAF/98	Resolution from URSI concerning frequencies for radio astronomy	—
IUCAF/99	Letter concerning representatives of IFRB on IUCAF	A. H. CATA

2nd January 1967

PERMANENT SERVICES

IUWDS

URSIGRAM CODES

SYNOPTIC CODES.

Following are extensions, replacements and additions to the codes in the IUWDS booklet « Synoptic Codes for Solar and Geophysical Data — Revised Edition 1965 » :

(*a*) URALO (page 81), under definition of symbols, under symbol « X » (in group JJXII), add 9 = neighborhood of 100,000 Mc/s.

(*b*) USOXA (page 61) is replaced by USOXE for reports of intensity of solar X-ray radiation as measured by satellites. The key to the new code USOXE is given as an attachment to this circular letter.

(*c*) PSTPA (details in circular RWC-92) is a provisional code which is strongly recommended for interchange and distribution messages from RWC to summarize the general solar and geophysical activity of the preceding 24 hours. Comments on this code are invited, since it is being considered for adoption as a code in the « U » (Universal) category. Note that the following modification was notified to RWC by telegram : After the key word PSTPA, insert a group JJtII where

JJ = Greenwich date of end of summary
t = number of groups following
II = indicator of RWC issuing the summary.

Also the definition of « ggg » should be « the mean (cosmic ray) level for day, in percentage ».

INDICATORS.

In « Synoptic Codes for Solar and Geophysical Data — Revised Edition 1965 » :

(*a*) On pages 157 and 168, add « 25 Sagamore Hill Observatory, Mass., USA; URANA and URANE; type of information II ».

(*b*) On pages 160 and 166, add «60 Los Angeles (Aerospace), USA; UFLAG, USSPO, UPATA, UPDIE, UACTA and URALO; types of information I and II ».

ADDRESSES.

In « Synoptic Codes for Solar and Geophysical Data — Revised Edition 1965 » :

(*a*) On page 16, Regional Warning Centers, Western Europe, for Paris Section 2.1.2
Telegraph should be : CNETAGI MEUDON TX 25312
Telephone should be : 626-1630.

(*b*) On page 17, Regional Warning Centers, for 2.2 Eurasia
Mail should be : Institute of Terrestrial Magnetism, Ionosphere and Radio Propagation (IZMIRAN) P. O. Akademicheskii Gorodok, Moscow Region, USSR.
Telegraph should be : 754 IZMIRAN MOSCOW.

NEW CODE.

A new code USOXE replaces USOXA for reporting the intensity of solar x-ray radiation as measured by satellites.

GENERAL FORM.

USOXE JJaII bHHmm cHHmm deffg hijjj

hijjj: 9 for aspect angle, positive or negative, in degrees and tenths of degrees

deffg: band of flux measurement, qualifier to flux given, flux in ergs cm^{-2} $sec^{-1} \times 10^{-g}$, exponent of power 10

cHHmm: number of groups to follow, UT end of satellite pass (or group of passes)

bHHmm: subjective importance of level of daily average flux, UT begin of satellite pass (or group of passes)

JJaII: UT date of observation, satellite, observatory indicator

USOXE: key word

DEFINITION OF SYMBOLS.

USOXE = key word, *SO*lar *X*-ray events, code E.

JJ = Greenwich date of observation

a = satellite

1 = 1965 — 16D Solar Radiation
2 = 1965 — 93A Explorer 30 (8-20A and 44-60A)

II = observatory indicator

01 = Arcetri
25 = US Naval Research Laboratory, Washington, D. C.
32 = Aberdeen, South Dakota
33 = ESSA Boulder
60 = Los Angeles (Aerospace)

b = importance of level of daily average flux

1 = lower than previous pass
2 = same as previous pass
3 = higher than previous pass
4 = much higher than previous pass
5 = saturated, usually plain language will follow
9 = value given in « deffg » is average flux value between times given in « bHHmm » and « cHHmm » (for group of passes)

HHmm = UT hours and minutes of beginning of satellite pass (or group of passes)

c = number of groups to follow

HHmm = UT hours and minutes of end of satellite pass (or group of passes)

d = band of flux measurement

0 = 0-3 Angstroms
1 = 0-8 Angstroms
2 = 8-12 Angstroms
3 = 8-20 Angstroms
4 = 44-60 Angstroms
5 = dispersed

e = qualifier to « ff »

0 = value on scale as given in « ff »
8 = less than value given in « ff »
9 = greater than value given in « ff »

ff = flux in ergs cm^{-2} $sec^{-1} \times 10^{-g}$

g = exponent of 10 in group « ff »

1 = 1
2 = 2
etc.

h = 9 always, indicates information on aspect angle

i = 2 signifies positive angle
5 signifies negative angle

jjj = aspect angle in degrees and tenths of degrees (normally group given only for first and last pass of day)

* * *

IQSY Notes No. 19, December 1966 is devoted to the 1966-1967 *World Days Programme* compiled by A. H. Shapley, P. Simon and J. V. Lincoln.

COSPAR — IQSY

1967 COSPAR-IQSY Assemblies

JULY 15 TO 29, 1967

The second Information Circular has been issued.

Under the general title «1967 IQSY/COSPAR Assemblies », the following meetings are to be held in London from 17 to 29 July 1967 at the invitation of the Royal Society.

IV Assembly of the Special Committee for the IQSY

Joint IQSY/COSPAR Symposium on the Scientific Results of the International Years of the Quiet Sun (IQSY)

X Plenary Meeting of the Committee on Space Research (COSPAR) and Meetings of COSPAR Working Groups and Panels

COSPAR Symposium on Sterilization Techniques.

The week 17 to 22 July will be devoted mainly to the joint IQSY-COSPAR Symposium and to other matters relating to the IQSY. The following week (24 to 29 July) will be devoted mainly to COSPAR meetings of various kinds, including sessions for the presentation of papers relating to topics which are of interest to COSPAR, but which lie outside the field to be covered by the joint IQSY/COSPAR Symposium.

The IQSY/COSPAR Symposium will be open to all scientists interested in the scientific programme, whether or not they are representatives of member countries of the two sponsoring ICSU Committees. Only invited papers will be presented at this Symposium, but ample opportunity will be given in each session for short contributions by way of discussion. Similarly, during the Tenth Plenary Meeting of COSPAR, there will be working group meetings, open to all scientists, for the presentation and discussion of papers.

JOINT IQSY/COSPAR SYMPOSIUM ON THE RESULTS OF THE IQSY.

The principal objective of the provisional scientific programme will be to review the preliminary scientific results obtained during

the IQSY in those disciplines of geophysics in which solar influence is an important factor. It is also intended to compare the new information obtained from ground stations and from rocket- and satellite-borne experiments, with earlier investigations made during the IGY when solar activity was last at its maximum. The programme of this joint IQSY/COSPAR Symposium is being arranged by the IQSY Committee in co-operation with Advisors, nominated jointly by the IQSY Bureau and Discipline Reporters, and the COSPAR Correspondents.

IV IQSY Assembly.

The last meeting of the Council for the IQSY (which is restricted to the Chief Delegate for each Participating Committee and the members of the IQSY Committee) will be held immediately before the Final IQSY Plenary Meeting on Saturday 22 July 1967.

Further information available by U. K. Secretariat, 1967 IQSY/COSPAR Assemblies, 6, Cornwall Terrace, London N. W. 1, U. K.

ICSU

Report on the meeting of the Executive Committee of ICSU

AT MONACO, DURING 7TH and 8TH OCTOBER 1966

by R. L. SMITH-ROSE, representing URSI

1. — GENERAL.

The Executive Committee of ICSU met at Monaco on the 7th and 8th October 1966. There were present representatives of all the scientific unions and of most of the inter-union commissions. The agenda for the meeting comprised reports from the Officers of ICSU, from the representatives of the fifteen scientific Unions, and of some twenty Committees and Commissions. The writer reported progress on behalf of URSI, IUCAF and IUCRM and, jointly with Professor Beynon and Dr. Friedman, on the replacement of IUCI and IUCSTR by the new Inter-Union Commission on Solar-Terrestrial Physics (IUCSTP). Professor Beynon also described the progress and future of the IQSY Special Committee, and of the Committee on Geophysics (CIG).

2. — URSI.

A reasonably detailed report was presented on the proceedings of the XVth General Assembly of URSI at Munich during the period 5th to 15th September 1966. The attendance and scientific programme were described, together with a summary of the main resolutions of interest. It was noted that four new national committees (Brazil, Hungary, Mexico and Nigeria) had become members of URSI, and that an application from Israel awaited confirmation. The changes in the officers were reported, together with the decision that the next General Assembly will be held in Canada during the summer of 1969.

3. — Inter-Union Commission on Solar-Terrestrial Physics.

At the XIth General Assembly of ICSU (Bombay, January 1966), it was resolved to establish the nucleus of a new « Inter-Union Commission on Solar-Terrestrial Physics (IUCSTP) ». This comprises : President, Dr. H. Friedman (COSPAR), together with Union representatives : Dr. Z. Svestka (IAU), Dr. J. G. Roederer (IUGG) and Professor W. J. G. Beynon (URSI). At the request of the President, Dr. C. M. Minnis (Secretary of the IQSY Committee) agreed to act as secretary to the Commission for the time being. Two meetings of this body were held during 1966 : the first during the assembly of COSPAR at Vienna in May; and the second during the Symposium on Solar-Terrestrial Physics, which was held in Belgrade in September 1966.

At the first of these, the problem of co-ordinating symposia in this field of physics was discussed; and it was agreed to consult the interested Unions and other ICSU bodies about their plans during the next few years.

At Belgrade, it was reported that a number of symposia have been proposed for the years 1968-1970 by several ICSU organisations to deal with topics within the field of solar-terrestrial physics. It was agreed that some re-arrangement and co-ordination of the proposals seemed to be desirable; and the Commission will take specific action on these lines. Preliminary consideration was given to various suggestions for future international programmes of observation in this field. In this connection, the Commission recommended the addition of a number of discipline representatives to its membership and also the inclusion of representatives of certain international organizations. It was not recommended that the Commission should include any national representatives.

There was, however, some discussion and even difference of opinion at the ICSU Board meeting at Monte Carlo as to the rate at which this new Inter-Union Commission should proceed. Resolution 7 of the XIth General Assembly of ICSU (Bombay, 1966), recommended the immediate establishment of the nucleus of IUCSTP to co-ordinate all ICSU symposia in the field of solar-terrestrial physics. The meeting was reminded that the new Commission could have the services of a small salaried secretariat; and that the Executive Committee was empowered to enlarge the Commission later, so that it may assume its other functions when

the IQSY Special Committee is dissolved in 1967. Further action on this matter would appear to await the next meeting of the ICSU Executive Committee later this year (1967).

4. — International Year of the Quiet Sun (IQSY).

Professor Beynon, President of the IQSY Committee, presented a report on its activities prepared by Dr. C. M. Minnis, its secretary. This stated that since the termination of the operational programme of IQSY in December 1965, the Committee was concentrating its attention on the following tasks :

(*a*) organization of the IVth IQSY Assembly in 1967 in London;

(*b*) publication of the « Annals of the IQSY »;

(*c*) consideration of the post-IQSY observational programme up to 1967.

Professor Beynon will be in the best position to amplify this report, and to describe the proposals for the forthcoming Assembly and future activities of the Committee.

5. — Inter-Union Commission on Frequency Allocations for Radio Astronomy and Space Science.

A report by the writer, as Secretary-General of this Commission (IUCAF), stated that, since the full meeting of the Commission in 1965, there had been smaller meetings of the members present at (i) COSPAR at Vienna in May; (ii) CCIR at Oslo in July; and (iii) URSI in Munich during September.

At these meetings, discussions took place on the steps to be taken to secure additional facilities and protection of frequencies for both radio astronomy and space research. Special consideration was given to the possibility of using on a shared basis, the sidebands of the standard frequency channels, as well as to the request for additional frequency allocations made by COSPAR to assist in the advancement of geodetic measurements by radio methods.

With regard to radio astronomy, the advantage of having an approximately harmonic relationship of the allocated frequencies was emphasised, together with the need for facilities to locate the natural radiation from Deuterium at 322-329 Mc/s, and for an extension of the band 1664-1668 Mc/s to explore several discrete bands of radiation from the OH molecule in space.

The Commission has maintained co-operation with the International Frequency Registration Board (Geneva), in drawing up a register of the frequencies used at Radio Observatories throughout the world.

One of the URSI representatives on IUCAF, Dr. R. Emberson, has found it necessary te resign : and the President and Secretary General of URSI are considering the nomination of a replacement.

6. — International Committee on Geophysics (CIG).

A report prepared by Dr. C. M. Minnis, Secretary, CIG, was presented at Monte Carlo by Professor W. J. G. Beynon, President of CIG. This report contained a recommendation that the existing CIG be replaced by a small co-ordinating committee representative of the four Unions concerned (IAU, URSI, IUGG and IUPAP), of the new Inter-Union Commission on Solar-Terrestrial Physics and of the World Data Centres (A, B and C). The CIG was represented at a meeting of the Council of FAGS in September 1966, at which co-operation on matters of common interest concerning the processing, collection and publication of geophysical data. It is assumed that Professor Beynon will be able to report on this and other recent activities of the CIG.

7. — Inter-Union Commission on Radio Meteorology (IUCRM).

The writer presented a brief account on the activities of IUCRM during the period 1963-1966, based on a report by Dr. J. A. Saxton, secretary of the Commission, submitted to the General Assembly of URSI at Munich. Two scientific meetings had been held : at Boulder in September 1964, and in Moscow in June 1965. Both meetings had been very successful; and the conclusions indicated a number of problems for future co-operative research. As arranged at Munich, Mr. J. A. Lane is the new URSI representative and succeeds Dr. Saxton as secretary. A nomination for a new chairman is awaited from UGGI.

The future programme of the Commission will be discussed in the near future.

8. — Publications.

The Year Book of ICSU for 1966 was published in April, and incorporated the changes resulting from the XIth General Assembly

(Bombay). It is expected that the 1967 Year Book will be available not later than February.

Three numbers of the ICSU Bulletin have been published. No. 9 to be published shortly will contain a full account of the VIth meeting of the Executive Committee, which is the subject of this brief report.

The second edition of « A Guide to ICSU Finances » by G. R. Laclavère, Treasurer was published in September 1966.

The revised Statutes and Rules of Procedure have been translated into French, Russian and Spanish. These will be published in the 1967 Year Book, and will also be available separately as a small booklet with a brief introduction to ICSU.

21*st January* 1967.

FAGS

MEETING OF THE COUNCIL OF FAGS

PARIS, 26 SEPTEMBER 1966

Abstracts of the Minutes

URSI was represented by Mr. A. H. Shapley and Dr. P. Simon, respectively Chairman and Secretary of IUWDS Steering Committee.

The following quotations have direct interest to URSI or to the Permanent Services where our Union is represented.

TRAVEL ON PERMANENT SERVICE BUSINESS.

FAGS Statute No. 15 states « The cost of travel and subsistence on essential Permanent Service business may be charged to the allocation of FAGS funds to that Service so long as it has been included in advance in the budget of the Service and approved by the Council of FAGS ».

Since the adoption of this Statute in 1964, several meetings requiring Permanent Service representation had been arranged at short notice. It was agreed that, instead of revising the Statute,

the FAGS Officers be empowered to permit the spending of up to 5 % of any Permanent Service Grant, in any given year, on travel and subsistence connected with meetings not specifically mentioned in the relevant annual estimate.

Co-operation with World Data Centres.

It was reported that the XI ICSU General Assembly held in Bombay 6-11 January 1966 agreed « (XI) To request the Council of FAGS to invite representatives of CIG and IQSY to discuss cooperation between FAGS and the WDCs ».

The President welcomed Dr. C. M. Minnis, Secretary of the CIG, and the IQSY Committee and asked him to introduce his report on WDCs.

Dr. Minnis stated that he had no specific proposals to make but wished to ensure that there was no unavoidable overlap between WDCs and the relevant Permanent Services. The WDCs stored raw data and, as with reference libraries, only a small amount of data was being used at any given moment. On the other hand FAGS members publish analysed data which is more widely used. Mr. Shapley stressed that WDC holdings were very useful when new data handling procedures were proposed and trials were necessary. After further discussion it was agreed :

(*a*) that FAGS Permanent Services be invited to send copies of their publications to relevant WDCs so that raw and reduced data would be available at the latter.

(*b*) to invite CIG or its successor to send an observer to future meetings of the Council of FAGS.

Tenth Anniversary of FAGS.

It was reported that Unesco is publishing a booklet to mark the Tenth Anniversary of FAGS and that French and English language editions would be available. The text had been supplied by Permanent Service Directors and the material had been reviewed by the FAGS Scientific Secretary and passed to Unesco with suggestions for illustrations. The booklet would probably not appear until late 1966 due to the imminent Unesco General Conference. 1000 copies would be distributed by Unesco and another 1000 copies would be distributed by FAGS within the ICSU family.

FAGS INCOME 1966.

It was reported that the FAGS income for 1966 totalled $ 48,200, consisting of

(*a*) $ 22.000 from the Unesco Subvention.

(*b*) $ 26.000 from ICSU.

(*c*) $ 200 unspent in 1965.

The letter from the ICSU Treasurer (FAGS Coun. 5 (66)) sent from Bombay on 18 January 1966 showing the detailed basis on which the ICSU Standing Finance Committee had arrived at the $ 26.000 grant was discussed. The Secretary stated that he had protested to the ICSU Treasurer that not only had the ICSU grant been broken down but the Unesco one had been similarly treated, giving the appearance that the functions of the Council of FAGS had been taken over by ICSU. The Secretary reported the explanation of the Treasurer of ICSU, that amounts for individual services had been requested from the ICSU Standing Finance Committee, because of the relatively large total request.

Dr. E. M. Fournier d'Albe was assured that it was the Council of FAGS which alone decided on the allocations to the Permanent Services and this the Council proceeded to do.

INSTALMENTS FOR 1966.

It was stated that the IUWDS 1965 balance would be largely used to meet the cost of the 1965 Code Book, the account for which was not presented until after the close of the financial year.

UNESCO GRANTS FOR FAGS IN 1967.

It was reported that there was a possibility that the money granted to FAGS by Unesco will be increased in 1967 from $ 22.000 p.a. to $ 25.000 p.a.; but no further Unesco contracts will be available for FAGS activities.

ICSU Abstracting Board

17, RUE MIRABEAU, PARIS 16e

Some characteristics of primary periodicals in the domain of the « Physical Sciences », June 1966, 68 pages.

This report is a detailed study of the main primary periodicals covering Physics all over the world. All the 1964 issues of more than 100 periodicals were studied in details. For each of these journals, information such as periodicity, number of scientific papers published, average length of papers, delay of publication, languages used, subscription rate, description of indexes published, etc..., are given including statistics on the most important data and comparison of the different results.

This report is a basic tool for all people interested in problems of scientific information as well as for scientits, libraries, documentation centers, editors of journals, etc..., dealing with Physics.

US $ 5.00

UNESCO

Appointment

We have the pleasure to inform our readers that Mr. P. Szulkin, Member of the Polish National Committee of URSI, has been appointed Director of the Division and Technical Training, Department of Application of Science to Development, UNESCO.

We wish to convey our warmest congratulations to Mr. P. Szulkin, and to express our most sincere wishes for a successful office.

INTERNATIONAL ASTRONAUTICAL FEDERATION

XVIIIth International Astronautical Congress

BELGRADE, YUGOSLAVIA, 24-30 SEPTEMBER 1967

Papers are being sought for the XVIIIth IAF Astronautical Congress to be held in Belgrade, 24-30 September 1967.

The International Astronautical Federation is composed of technical societies around the world dealing with the advancement of astronautics.

The Congress is held annually and contributions from many nations participating in space flight development or simply in research on astronautical problems are presented.

The programme is determined by an International Programme Committee in cooperation with the Bureau of the IAF.

Persons desiring to present a paper need not necessarily be members of a Society adhering to the IAF, nor do they have to be sponsored by a member Society. Papers proposed will be judged solely on their merits.

All persons desiring to present a paper must submit a summary as long as required for an objective evaluation of the paper, or a full-length manuscript. Only original papers should be submitted.

Summaries or manuscripts should be sent to the Chairman of the session for which the paper is proposed.

The deadline for submitting papers is 1 April 1967.

Further information available by request to International Astronautical Federation, 250, rue Saint Jacques, Paris 5e, France.

URSI PUBLICATIONS

The following publications are on sale by Elsevier Publishing Company, Amsterdam, London, New York.

BEYNON. — *Some Ionospheric Results obtained during the International Geophysical Year.* Proceedings of a Symposium organized by the URSI-AGI Committee, Brussels 1959.

BROWN. — *Space Radio Communication.* A Symposium held under the auspices of URSI in Paris, September, 1961.

PIGGOT/RAWER. — *URSI handbook of Ionogram Interpretation and Reduction.*

BEYNON. — *Monograph on Ionospheric Radio.* Proceedings of Commission III during the XIIIth General Assembly of URSI, London, 1960.

DECAUX. — *Monograph of Radioelectric Measurements and Standards/ Monographie sur les Mesures et Etalons Radioélectriques.* XIIIth General Assembly of URSI, London, 1960.

HORNER. — *Monograph on Radio Noise of Terrestrial Origin.* Proceedings of Commission IV during the XIIIth General Assembly of URSI, London, 1960.

SAXTON. — *Monograph on Radio-Wave Propagation in the Troposphere.* Proceedings of Commission II on Radio and Troposphere during the XIIIth General Assembly of URSI, London, 1960.

SILVER. — *Monograph on Radio Waves and Circuits.* Proceedings of Commission VI during the XIIIth General Assembly of URSI, London, 1960.

BEATTY. — *Radio Standards and Measurements.*

Progress in Radio Science 1960-1963, Volume I.

Proceedings of Commission I on Radio Measurements and Standards during the XIVth General Assembly of URSI, Tokyo, September, 1963.

BROWN. — *The Ionosphere.*

Progress in Radio Science, 1960-1963, Volume III.

Review papers presented at Commission III on Ionospheric Radio during the XIVth General Assembly of URSI, Tokyo, September, 1963.

HORNER. — *Radio Noise of Terrestrial Origin.*

Progress in Radio Science 1960-1963, Volume IV.

Proceedings of Commission IV during the XIVth General Assembly of URSI, Tokyo, September 1963.

DU CASTEL. — *Radio and Troposphere.*

Progress in Radio Science 1960-1963, Volume II.

Proceedings of Commission II on Radio and Troposphere, during the XIVth General Assembly of URSI, Tokyo, September, 1963.

HERBAYS/WARWICK/COUTREZ/GONZE. — *Radio Astronomy.*

Progress in Radio Science 1960-1963, Volume V.

Report of Commission V on Radio Astronomy during the XIVth General Assembly of URSI, Tokyo, September, 1963.

STUMPERS. — *Radio Waves and Circuits.*

Progress in Radio Science 1960-1963, Volume VI.

Proceedings of Commission VI on Radio Waves and Circuits during the XIVth General Assembly of URSI, Tokyo, September, 1963.

BURGESS. — *Radioelectronics.*

Progress in Radio Science 1960-1963. Volume VII.

Proceedings of Commission VII during the XIVth General Assembly of URSI, Tokyo, September, 1963.

MAEDA/SILVER. — *Space Radio Science.*

Progress in Radio Science 1960-1963, Volume VIII.

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RAPPORT SPÉCIAL No. 2. — *Les Phénomènes de Marée dans l'Ionosphère* (1951).

SPECIAL REPORT No. 3. — *Discrete Sources of Extra-Terrestrial Radio Noise* (1954).

RAPPORT SPÉCIAL No. 3. — *Les Sources Discrètes d'Emission Radioélectrique Extra Terrestre* (1954).

RAPPORT SPÉCIAL No. 4. — *Distribution de la Brillance Radioélectrique sur le Disque Solaire* (1954).

RAPPORT SPÉCIAL No. 5. — *L'Hydrogène Interstellaire* (1954).

URSI SPECIAL REPORT No. 6. — *Radio Observations of the Aurora* (1961).

URSI SPECIAL REPORT No. 7. — *The Measurement of Characteristics of Terrestrial Radio Noise* (1962).

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Third Joint Commission on Radio Meteorology, Brussels, August, 1954.

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1. Résonances de la cavité terre-ionosphère (9 p., 12 fig.).
2. Structure, polarisation et propagation des oscillations hydromagnétiques (27 p., 22 fig.).
3. Relations entre les émissions hydromagnétiques et les perturbations de la magnétosphère (15 p., 14 fig.).
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